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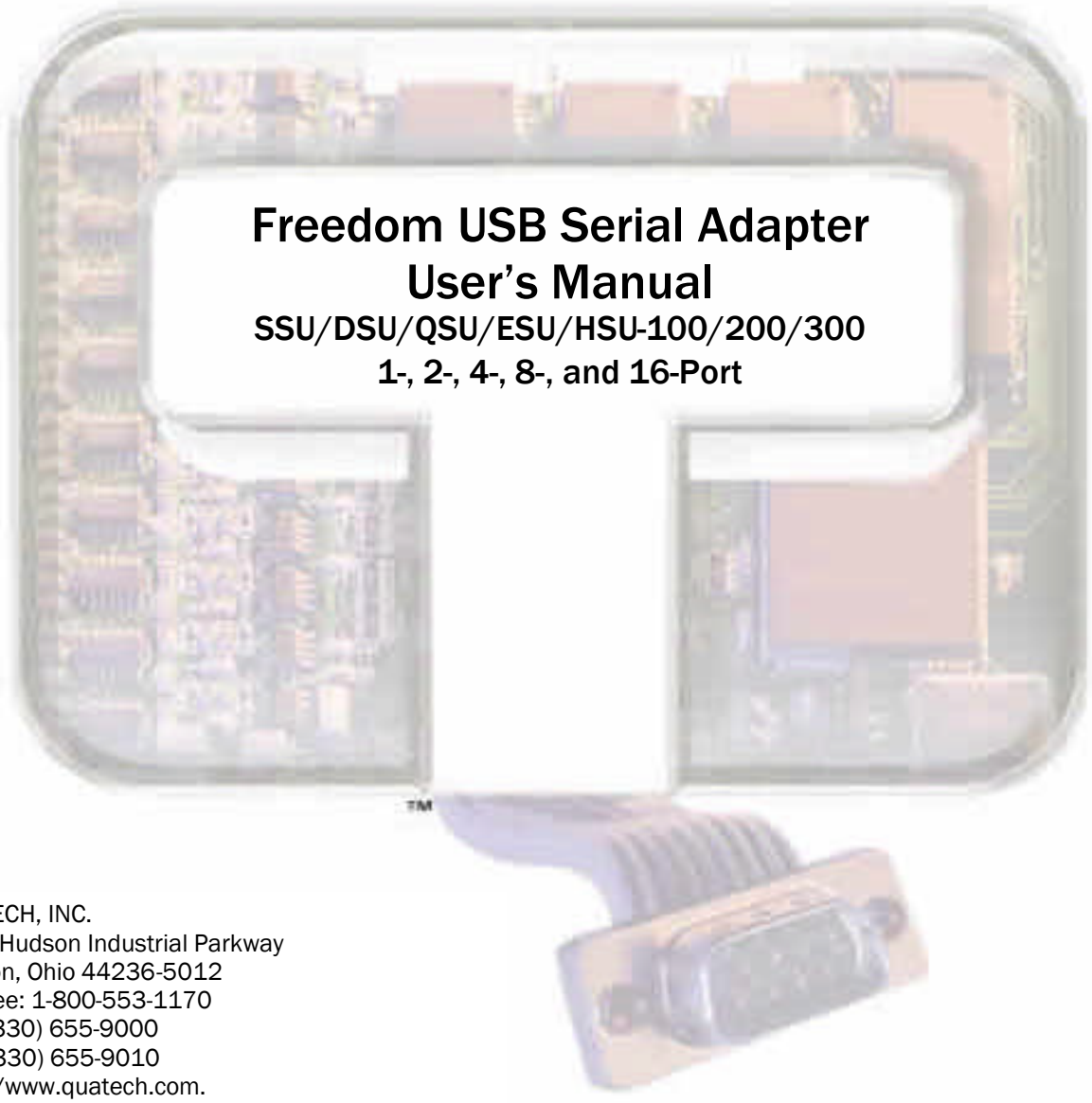
QUATECH

CONNECT WITH RELIABILITY

Freedom USB Serial Adapter User's Manual

SSU/DSU/QSU/ESU/HSU-100/200/300

1-, 2-, 4-, 8-, and 16-Port



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SSU/DSU/QSU/ESU/HSU-100/200/300
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Introduction

Note: These products comply fully with USB Specification version 1.1 and are fully supported under Windows 98/ME/XP/2000/NT4.

This Users Manual describes how to setup and install your Quatech Freedom USB Adapter.

The Quatech SSU-100, DSU-100, QSU-100, ESU-100, and HSU-100, respectively, provide one, two, four, eight, and sixteen independent RS-232 serial interfaces to the host PC via the Universal Serial Bus (USB) port.

The Quatech DSU-200/300, QSU-200/300, ESU-200/300, and HSU-200/300, respectively, provide two, four, eight, and sixteen independent asynchronous serial interfaces via the USB port. Each of these interfaces can be used as desired for either RS-422 or RS-485 communications.

For convenience, this manual refers to all these products as Freedom USB unless otherwise noted.

The following table details the port and connection configuration for all the Freedom USB devices.

Table 1 - Device port and connection options

Device	Ports	Connection	Device	Ports	Connection
SSU-100	1	RS-232			RS-422
DSU-100	2	RS-232	DSU-200/300	2	RS-422
QSU-100	4	RS-232	QSU-200/300	4	RS-422
ESU-100	8	RS-232	ESU-200/300	8	RS-422
HSU-100	16	RS-232	HSU-200/300	16	RS-422

Note: The 16550 is well suited for applications involving high data rates and for heavy multitasking environments. The larger FIFO allows each read/write access to the UART to move more data, resulting in fewer interrupts and less processor time spent servicing the UART.

Each adapter comes standard with 16550 Universal Asynchronous Receiver/Transmitters (UARTs) containing 16-byte First In First Out (FIFO) storage devices. These FIFOs, in conjunction with the USB micro controller FIFOs, help to relieve the CPU of excessive interrupts by buffering received and transmitted data. This configuration allows each channel (either two or four) to obtain data rates up to 460.8 kbps. The adapters are USB bus-powered; therefore no external power supply is required.

The Freedom USB products are Plug-and-Play devices and require no hardware configuration. Your computer's BIOS or operating system automatically configures the ports when you install the device.

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System requirements

Note: The 16-port units (HSU-100/200/300) require two USB ports. All the other units use only one USB port.

Quatech's serial USB adapters require the Windows 98/Me/XP/2000/NT4 operating system and an IBM or IBM-compatible PC with a standard USB port or an add-in USB host adapter. Contact our sales department for details on current software offerings. Most device drivers are available for download from the Quatech World Wide Web site at http://www.quatech.com/.

Features

Quatech offers an IND option, or surge-suppression board upgrade, to provide improved performance and industrial-grade reliability.

IND option - surge suppression upgrade

The IND option provides essential protection for reliable use in an industrial environment. Each communication line has a surge suppressor capable of sustaining up to 40-A, 20-µs peak transient surges, a clamping voltage of 30 V (15.1 V for 200/300 units), and a peak energy dissipation of 0.1 Joules.

Table 2 differentiates between the Freedom USB-1/2/300 part numbers with and without the IND option.

Table 2 - Product series summary

Part number	IND option	Part number	IND option
SSU-100	no		
DSU-100	no	DSU-200/300	no
DSU-100IND	yes	DSU-200/300IND	yes
QSU-100	no	QSU-200/300	no
QSU-100IND	yes	QSU-200/300 IND	yes
ESU-100	no	ESU-200/300	no
ESU-100IND	yes	ESU-200/300 IND	yes
HSU-100	no	HSU-200/300	no
HSU-100IND	yes	HSU-200/300 IND	yes

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Installing the Freedom USB

Note: The installation process takes place in two stages: the serial adapter board and then the serial ports.

Caution! Be sure to allow the installation process to finish without interruption. If you stop the process before the adapter board(s) and all of the serial ports are installed, you will corrupt the installation.

This section explains how to install the Freedom USB under different operating systems. Please locate and follow the procedure for your computer's operating system.

Windows maintains a registry of all known hardware installed in your computer in which it keeps track of all of your system resources, such as I/O locations, IRQ levels, and DMA channels. The Add New Hardware Wizard utility helps you to add new hardware and updates this registry.

The Freedom USB includes an INF configuration file to allow easy configuration in the Windows environment. Windows uses the INF file to determine the system resources required by the Freedom USB, searches for available resources to fill the boards requirements, and then updates the hardware registry with an entry that allocates these resources.

The Freedom USB also includes Windows device drivers that enable the Freedom USB serial ports to appear to Windows as standard COM ports.

Installing under Windows XP

Follow these steps to install the Freedom USB under Windows XP.

Step	Procedure	Description
❑ Step 1	Turn on the power to your computer system.	*This is the system in which the Freedom USB is to be installed.*
❑ Step 2	Plug the wide flat end of the USB cable into the downstream connector.	*This is the connector located on the back of the computer or USB hub.*
❑ Step 3	Plug the square end of the USB cable into the back of the Freedom USB box.	*Windows tells you that it has found new hardware and launches the Found New Hardware Wizard.*

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Figure 1 illustrates the Win XP Found new hardware prompt. The Found New Hardware Wizard launches automatically when you first plug in the Freedom USB serial adapter.

Figure 1 - Win XP Found new hardware prompt



Step	Procedure	Description
❑ Step 4	Insert the Quatech installation CD into your CD-ROM drive.	*This is the CD that shipped with the Freedom USB.*
❑ Step 5	Click the Next button.	*The Choose your search and installation options prompt displays.*

Figure 2 illustrates the Win XP Choose your search and installation prompt.

Figure 2 - Win XP Choose your search and installation options prompt

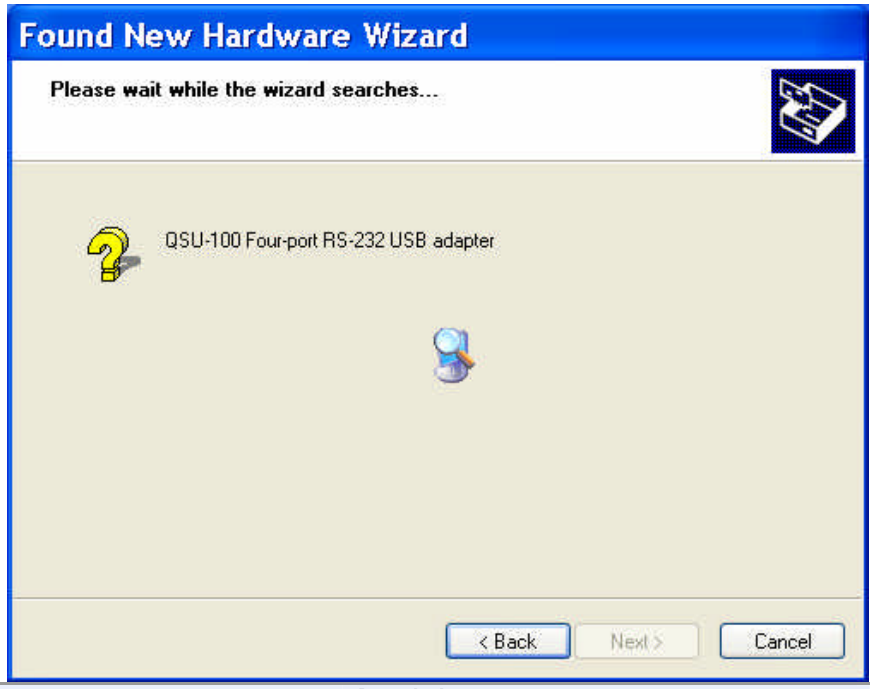


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Step	Procedure	Description
❑ Step 6	Select Search removable media (floppy, CD-ROM).	*If necessary, you can also select the Include this location in the search: option and browse to the location with the Freedom USB drivers.* *The complete path is E:\Serial Port Adapters\Drivers\Windows 95, 98, Me, 2000, XP for USB \Enhanced.* *Replace E:\ with your CD-ROM designation*
❑ Step 7	Click the Next button.	*Windows searches for drivers for the serial USB adapter.*

Figure 3 - Win XP Searches drivers prompt

Figure 3 illustrates the Win XP Searches for drivers prompt. When the Wizard finds the Freedom USB drivers, this screen disappears.



Step	Procedure	Description
❑ Step 8	The Wizard locates and starts to install the necessary software, then notifies you that Windows XP has not certified the software.	*The warning appears just as the installation starts and indicates that Windows XP has not yet tested the software. Note that the software does work properly with XP.*

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Figure 4 shows the Windows XP Logo testing warning. This indicates only that Windows has not certified the Freedom USB. Rest assured that Quatech's drivers work properly with Windows XP.

Figure 4 - Win XP software logo warning



Step	Procedure	Description
❑ Step 9	Click the Continue Anyway button.	
❑ Step 10	The Wizard proceeds with the installation.	*The Wizard installs the software prompt displays, followed by the Finished installing prompt.*

Figure 5 is the Win XP Wizard installs the software prompt. This screen shows you the target directory for the installation.

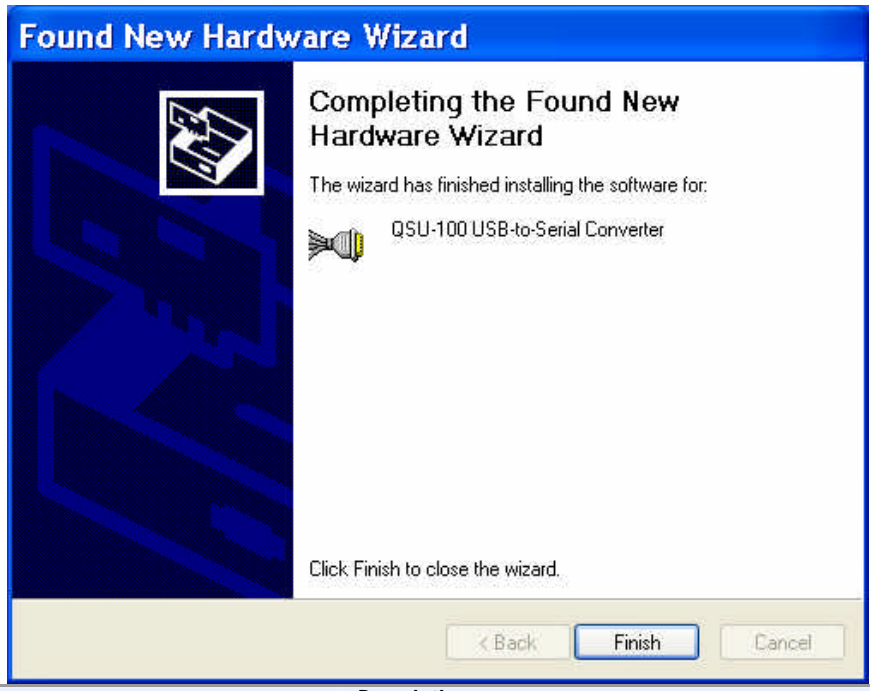
Figure 5 - Win XP Wizard installs the software prompt



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Figure 6 - Win XP Finished installing prompt

Figure 6 shows the Win XP Finished installing prompt. It indicates that the serial USB adapter has been successfully installed.



Step	Procedure	Description
❑ Step 11	Press the Finish button to continue.	*The USB adapter installation is complete. Next, the Wizard installs the serial USB port(s).* *The Install software for USB serial port prompt displays.*

Figure 7 - Win XP Install software for USB serial port prompt

Figure 7 indicates that the wizard is ready to install the USB ports.

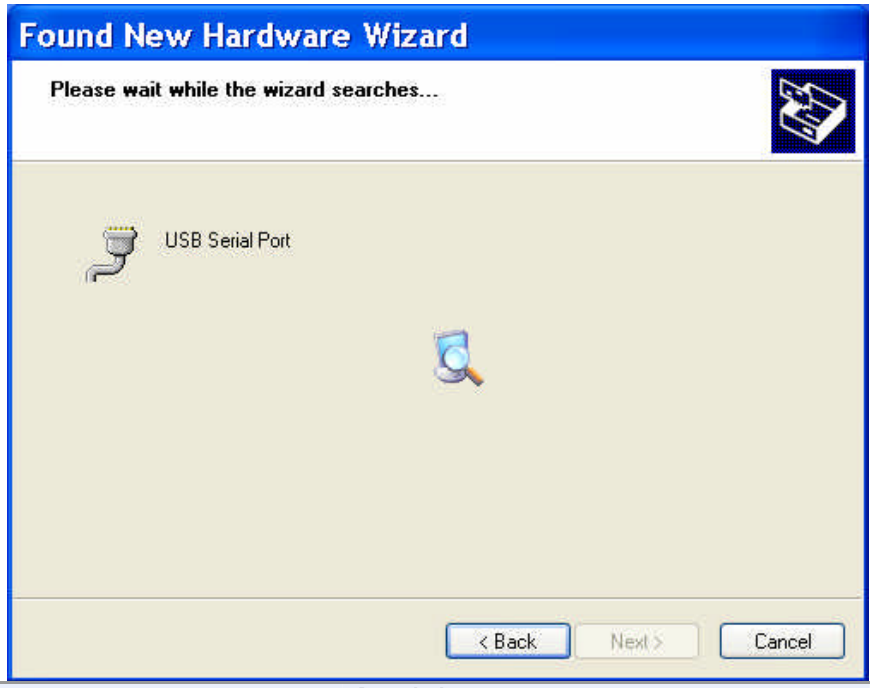


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Step	Procedure	Description
❑ Step 12	Make sure that the Quatech CD is in your CD-ROM drive.	*This is the CD that shipped with your Freedom USB adapter.*
❑ Step 13	Select the Install the software automatically (Recommended) option.	*The Wizard should go automatically to the USB driver location. If necessary, you can browse to the correct location.* *The complete path is E:\Serial Port Adapters\Drivers\Windows 95, 98, Me, 2000. XP for USB\Enhanced. Replace E: with your CD-ROM drive designation.*
❑ Step 14	Click the Next button to continue.	*The wizard prompts you to wait while it searches for serial USB port drivers.*

Figure 8 - Win XP Searches for Quatech serial port screen

Figure 8 illustrates the wizard searching for the serial USB port driver.

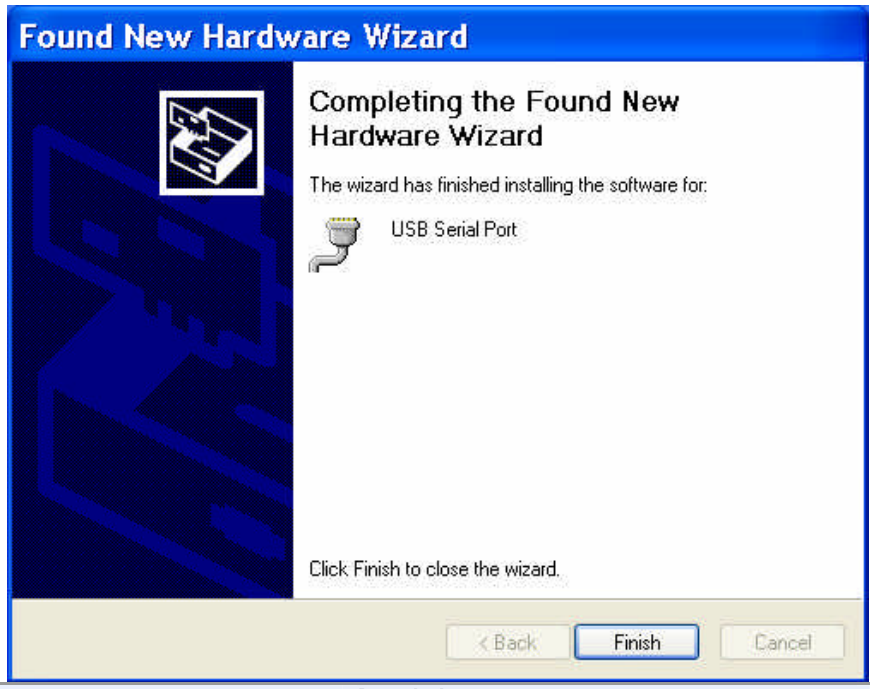


Step	Procedure	Description
❑ Step 15	The wizard completes the installation and displays the Installation complete prompt.	

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Figure 9 displays when the file copying process is finished.

Figure 9 - Win XP Installation complete prompt



Step	Procedure	Description
❑ Step 16	Click the Finish button.	*The Wizard briefly displays the Unknown hardware found and Installing messages as it installs each serial USB port.*
❑ Step 17	Repeat Steps 12-16 for each port.	*Your Freedom USB adapter installation is complete!*

Uninstalling from Windows XP

Follow these steps in the event that you need to uninstall or reinstall the Freedom USB software.

1. From the Control Panel, select System.
2. Press the Hardware tab.
3. Click on Device Manager.
4. Scroll down to Multi-port serial adapters and expand.
5. Highlight your Quatech Freedom USB; for example, QSU-100 Quad RS-232 Serial Ports (Group ID1).
6. Select the Action menu option.
7. Select Uninstall from the drop down menu.
8. Click OK at the Confirmation screen. Note that this also removes all the serial ports associated with your Freedom USB.

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Installing under Windows 2000

Follow these steps to install the Freedom USB under Windows 2000.

Step	Procedure	Description
❑ Step 1	Turn on the power to your computer system.	*This is the system in which the Freedom USB is to be installed.*
❑ Step 2	Plug the wide flat end of the USB cable into the downstream connector.	*This is the connector located on the back of the computer of USB hub.*
❑ Step 3	Plug the square end of the USB cable into the back of the Freedom USB box.	*Windows tells you that it has found new hardware and launches the Add New Hardware Wizard. The Found new hardware prompt displays.*

Figure 10 - Win 2000 Found new hardware prompt

Figure 10 illustrates the Win 2000 Found new hardware prompt. The Found New Hardware Wizard launches automatically when you first plug in the Freedom USB serial adapter.



Step	Procedure	Description
❑ Step 4	Click the Next button.	*The Search for or display drivers prompt displays.*

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Figure 11 - Win 2000 Search for or display drivers prompt

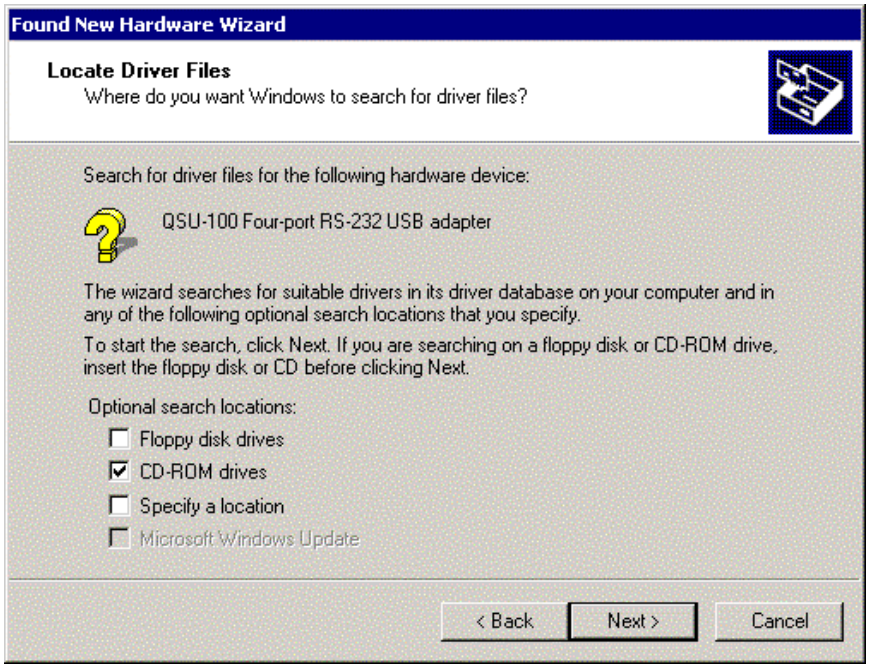
Figure 11 shows the Win 2000 Search for or display drivers prompt.



Step	Procedure	Description
❑ Step 5	Insert the Quatech installation CD into your CD-ROM drive.	*This is the CD that shipped with the Freedom USB.*
❑ Step 6	Select Search for a suitable driver for my device (recommended)	
❑ Step 7	Click the Next button.	*The Locate driver files prompt displays.*

Figure 12 - Win 2000 Locate driver files prompt

Figure 12 illustrates the Win 2000 Locate driver files prompt.

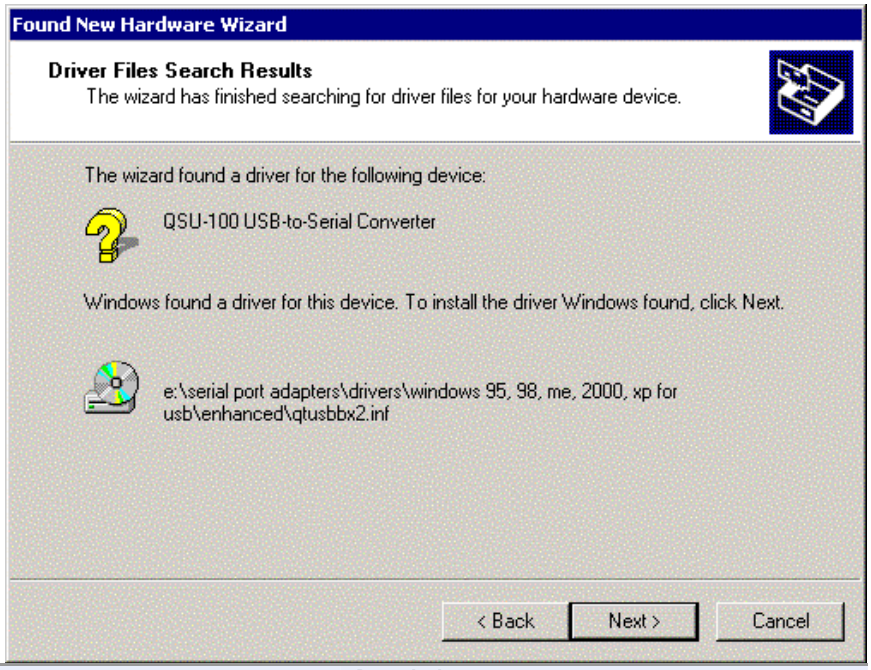


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Step	Procedure	Description
❑ Step 8	Select CD-ROM drives.	*If necessary, you can also select Specify a location: and browse to the desired location with the Freedom USB drivers.* *The complete path is E:\Serial Port Adapters\Drivers\Windows 95, 98, Me, 2000, XP for USB \Enhanced.* *Replace E:\ with your CD-ROM drive designation.*
❑ Step 9	Click the Next button.	*Windows searches for drivers for the serial USB adapter. The Finished searching for driver files prompt displays.*

Figure 13 - Win 2000 Finished searching for driver files prompt

Figure 13 illustrates the Win 2000 Finished searching for driver files prompt.

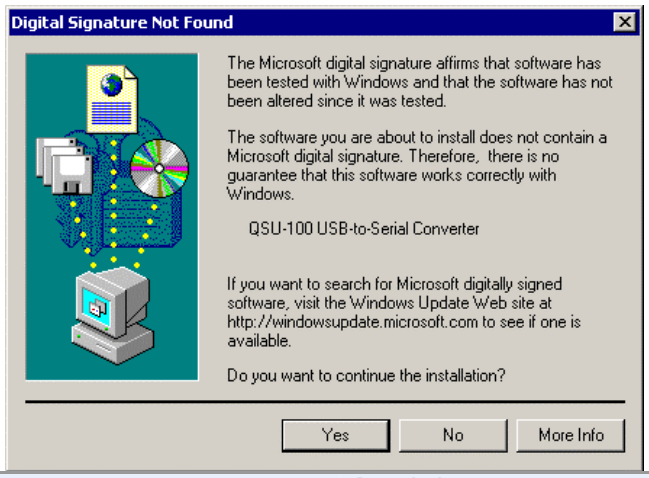


Step	Procedure	Description
❑ Step 10	Click the Next button.	
❑ Step 11	The Wizard locates and starts to install the necessary software, then notifies you that Windows 2000 has not certified the software.	*The warning appears just as the installation starts and indicates that Windows 2000 has not yet tested the software. Note that the software does work properly with Windows 2000.*

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Figure 14 - Win 2000 Software logo warning

Figure 14 shows the Windows 2000 Logo test warning. This indicates only that Windows has not certified the Freedom USB. Rest assured that Quatech's drivers work properly with Windows 2000.



Step	Procedure	Description
❑ Step 12	Click the Yes button.	
❑ Step 13	The Wizard proceeds with the installation.	*The Please wait while the Wizard installs the software screen displays, followed by the Finished installing prompt.*

Figure 15 - Win 2000 Finished installing prompt

Figure 15 is the Win 2000 Finished installing prompt. It indicates that the serial USB adapter has been successfully installed.



Step	Procedure	Description
❑ Step 14	Press the Finish button to continue.	*The USB adapter installation is complete. Next, the Wizard installs the USB port(s).* *The Install software for USB serial port prompt displays.*

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Figure 16 - Win 2000 Install software for USB serial port prompt

Figure 16 indicates that the wizard has detected and is ready to install the USB ports.



Step	Procedure	Description
❑ Step 15	Make sure that the Quatech CD is still in your CD-ROM drive.	*This is the CD that shipped with your Freedom USB adapter.*
❑ Step 16	Click the Next button to continue.	*The Search for or display device driver prompt displays.*

Figure 17 - Win 2000 Search for or display device driver prompt

Figure 17 illustrates the Win 2000 Search for or display device driver prompt.

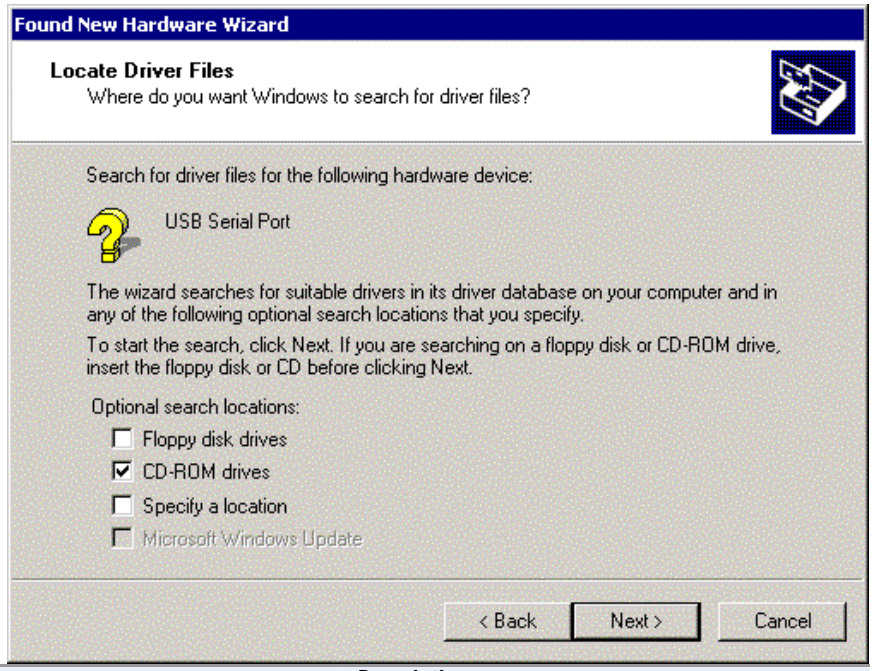


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Step	Procedure	Description
❑ Step 17	Select Search for a suitable driver for my device (recommended)	
❑ Step 18	Click the Next button.	*The Locate driver files prompt displays.*

Figure 18 - Win 2000 Locate driver files prompt

Figure 18 illustrates the Win 2000 Locate driver files prompt.



Step	Procedure	Description
❑ Step 19	Select CD-ROM drives.	*If necessary, you can also select the Specify a location: option and browse to the location with the Freedom USB drivers.* *The complete path is E:\Serial Port Adapters\Drivers\Windows 95, 98, Me, 2000, XP for USB \Enhanced.* *Replace E:\ with your CD-ROM drive designation.*
❑ Step 20	Click the Next button.	*Windows searches for drivers for the serial USB adapter. The Finished searching for driver files prompt displays.*

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Figure 19 - Win 2000 Finished searching for driver files prompt

Figure 19 illustrates the Win 2000 Finished searching for driver files prompt.



Step	Procedure	Description
❑ Step 21	Click the Next button.	*The wizard completes the installation and displays the Installation complete prompt.*

Figure 20 - Win 2000 Installation complete prompt

Figure 20 displays when the file copying process is finished.



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Step	Procedure	Description
❑ Step 22	Click the Finish button.	*The Wizard briefly displays a series of Unknown hardware found and Installing messages as it installs each serial USB port. Your Freedom USB adapter installation is complete!*

Uninstalling from Windows 2000

Follow these steps in the event that you need to uninstall or reinstall the Freedom USB software.

1. From the Control Panel, select System – Hardware. Select the Hardware wizard and click Next.
2. Choose Uninstall/Unplug a device. Click Next.
3. Choose Uninstall a device. Click Next.
4. Scroll down to Quatech Freedom USB Serial Adapter; for example, QSU-100 Quad RS-232 Serial Ports (Group ID2). Select and click Next.
5. Select Yes, I want to uninstall this device at the Confirmation screen. Click Next.

Installing under Windows NT

Note: Windows NT supports up to 256 serial ports.

You must install the Windows NT device driver by running the SETUP program, a command line-based configuration utility for adding USB bus and ISA bus serial ports.

Note: NT Installation CDs are free but need to be specifically ordered.

Be sure to request an installation CD when you order your Freedom USB. The CD is free, but it is not shipped automatically. You can also use an on-line form to request the drivers at www.Quatech.com/usbnt.htm. You will need to provide your model and serial number on the form.

See your Quatech sales representative for further information.

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Installing under Windows Me

Follow these steps to install the Freedom USB under Windows Me.

Step	Procedure	Description
❑ Step 1	Turn on the power to your computer system.	*This is the system in which the Freedom USB is to be installed.*
❑ Step 2	Plug the wide flat end of the USB cable into the downstream connector.	*This is the connector located on the back of the computer of USB hub.*
❑ Step 3	Plug the square end of the USB cable into the back of the Freedom USB box.	*Windows tells you that it has found new hardware and launches the Add New Hardware Wizard.*

Figure 21 illustrates the Win Me Add New Hardware Wizard's Found new hardware prompt. The Add New Hardware Wizard launches automatically when you first connect the Freedom USB. The Found new hardware prompt, lets you specify the directory in the Quatech installation disc from which to install the Freedom USB under Win Me.

Figure 21 - Win Me Found new hardware prompt



Step	Procedure	Description
❑ Step 4	Insert the Quatech installation disk in your CD-ROM drive.	*This is the CD that shipped with the Freedom USB.*
❑ Step 5	Check the Automatic search for a better driver (Recommended) checkbox and click the Next button.	*Windows searches for drivers for your Freedom USB and then begins copying them from the CD-ROM.* *If necessary, you can browse to the correct directory location. The correct path is E:\Serial Port Adapters\Drivers\Windows 95, 98, Me, 2000, XP for USB\Enhanced.* *Replace E:\ with your CD-ROM drive designation.*

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Figure 22 - Win Me Driver file search prompt

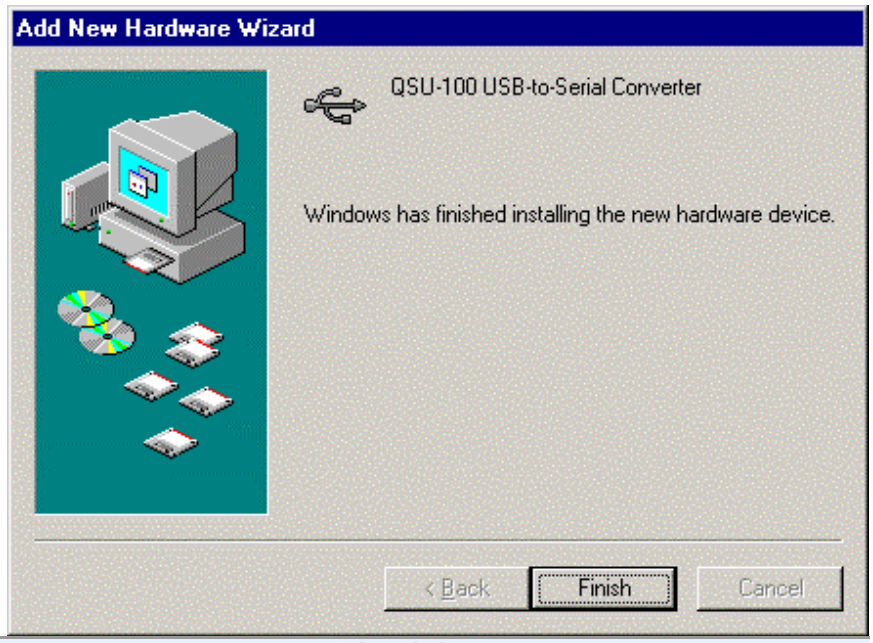
Figure 22 shows the Win Me Driver file search prompt.
If Windows finds the files for you automatically, this screen notifies you that Windows is installing the software.
If you specify a driver location, this screen displays that location. It also offers you the chance to press Back to select a different driver or to press Next to begin the installation process.



Step	Procedure	Description
❑ Step 6	When the file copying process is completed, the wizard displays the finished installing prompt.	

Figure 23 - Win Me Finished installing prompt

Figure 23 indicates that Windows has finished installing the software for your USB.



Step	Procedure	Description
❑ Step 7	Click the Finish button.	*Windows tells you that it has found new hardware and launches the Add New Hardware Wizard to install the serial ports.*

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Figure 24 - Win Me Ready to install prompt

Figure 24 shows the Win Me Found new hardware prompt. You can choose to either have Windows automatically search for a driver or to specify the location of the driver you want to use.



Step	Procedure	Description
❑ Step 8	Check the Automatic search for a better driver (Recommended) checkbox and click the Next button.	*Windows searches for drivers for your Freedom USB and then begins copying them from the CD-ROM.*

Figure 25 - Win Me Driver file search prompt

Figure 25 shows the Win Me Driver file search prompt.
If Windows finds the files for you automatically, this screen notifies you that Windows is installing the software.
If you specify a driver location, this screen displays that location. It also offers you the chance to press Back to select a different driver or to press Next to begin the installation process.



Step	Procedure	Description
❑ Step 9	When the file copying process is completed, the wizard displays the finished installing prompt.	

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Figure 26 shows the Win Me Finished installing prompt. This prompt displays at the end of the installation process.

Figure 26 - Win Me Finished installing prompt



Step	Procedure	Description
❑ Step 10	Click the Finish button.	*The wizard briefly displays Unknown hardware found and Installing messages as it installs the serial ports. When the desktop displays, your Freedom USB installation is complete!*

Uninstalling from Windows Me

Follow these steps in the event that you need to uninstall or reinstall the Freedom USB software.

1. From the Control Panel, select System.
2. Select the Device Manager tab.
3. Expand Multifunction adapters.
4. Highlight Quatech Freedom USB; for example, QSU-100 USB-to-Serial Converter. Click Remove.
5. Click OK at the Confirmation screen. Note that this also removes all the serial ports associated with your Freedom USB.

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Installing under Windows 98/98SE

Follow these steps to install your Freedom USB in Windows 98/98SE.

Step	Procedure	Description
❑ Step 1	Turn on the power to your computer system.	*This is the system in which the Freedom USB is to be installed.*
❑ Step 2	Plug the wide flat end of the USB cable into the downstream connector.	*This is the connector located on the back of the computer of USB hub.*
❑ Step 3	Plug the square end of the USB cable into the back of the Freedom USB box.	*Windows tells you that it has found new hardware and launches the Add New Hardware Wizard.*

Figure 27 shows the Win 98/98SE Add New Hardware Wizard searching for new drivers prompt. The Wizard launches automatically when you first connect the Freedom USB.

Figure 27 - Win 98/98SE Searches for new drivers prompt



Step	Procedure	Description
❑ Step 4	Click the Next button.	*The Search or select prompt displays.*

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Figure 28 - Win 98/98SE Search or select prompt

Figure 28 shows the 98/98SE Search or select prompt with the Search for the best driver option selected.



Step	Procedure	Description
❑ Step 5	Select Search for the best driver for your device (Recommended); then click the Next button.	*The Search for new drivers prompt displays.*

Figure 29 - Win 98/98SE Search for new drivers prompt

Figure 29 shows the Search for new drivers prompt.
If Windows finds the files for you automatically, this screen notifies you that Windows is installing the software.
If you specify a driver location, this screen displays that location. It also offers you the chance to press Back to select a different driver or to press Next to begin the installation process.



Step	Procedure	Description
❑ Step 6	Select the Specify a location check box.	*You may be able to install the software by checking the CD-ROM drive check box. If not, you need to specify a location.*

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Step	Procedure	Description
❑ Step 7	Insert the Quatech installation CD into your CD-ROM drive.	*This is the CD that shipped with the Freedom USB.*
❑ Step 8	Browse or use the down arrow to map to the correct driver location.	*The complete path is E:\Serial Port Adapters\Drivers\Windows 95, 98, Me, 2000, XP for USB\Enhanced.* *Replace E:\ with your CD-ROM drive designation.*
❑ Step 9	Click the Next button.	*The Ready to install the best driver prompt displays.*

Figure 30 - Win 98/98SE Ready to install the best driver prompt

Figure 30 shows the 98/98SE Ready to install the best driver prompt, which lets you double-check the device that you are installing and the location of the driver.



Step	Procedure	Description
❑ Step 10	Confirm that the device and driver location are correct. Click the Next button.	*If necessary, use the Back button to return to the previous screen.* *Windows builds a driver information base, copies the appropriate files from the CD, and then displays the Finished installing software prompt.*

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Figure 31 - Win 98/98SE Finished installing software prompt

Figure 31 indicates that Windows has finished installing the software for your USB's adapter board. Next it will install each serial port



Step	Procedure	Description
❑ Step 11	Click the Finish button.	*Windows tells you that it has found new hardware and launches the Add New Hardware Wizard to install the serial ports.*

Figure 32 - Win 98/98SE Searches for new drivers prompt

Figure 32 shows the start of the serial port installation process.



Step	Procedure	Description
❑ Step 12	Click the Next button.	*The Search or display prompt displays.*

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Figure 33 - Win 98/98SE Search or display prompt

Figure 33 shows the 98/98SE Search or display prompt.



Step	Procedure	Description
❑ Step 13	Select Search for the best driver for your device; then click the Next button.	*The Search for new drivers prompt displays.*

Figure 34 - Win 98/98SE Search for new drivers prompt

Figure 34 shows the 98/98SE Search for new drivers prompt. If Windows finds the files for you automatically, this screen notifies you that Windows is installing the software.
If you specify a driver location, this screen displays that location. It also offers you the chance to press Back to select a different driver or to press Next to begin the installation process.



Step	Procedure	Description
❑ Step 14	Select the Specify a location check box in the driver location prompt.	*You may be able to install the software by checking the CD-ROM drive check box. If not, you need to specify a location.*

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Step	Procedure	Description
❑ Step 15	Make sure that the Quatech installation CD is still in your CD-ROM drive.	*This is the CD that shipped with the Freedom USB.*
❑ Step 16	If necessary, browse or use the down arrow to map to the correct driver location. Click the Next button.	*The complete path is E:\Serial Port Adapters\Drivers\Windows 95, 98, Me, 2000, XP for USB\Enhanced.* *Replace E: with your CD-ROM drive designation.* *The Ready to install prompt displays.*

Figure 35 - Win 98/98SE Ready to install prompt

Figure 35 shows the 98/98SE Ready to install the prompt, which lets you double-check the device that you are installing and the location of the driver.



Step	Procedure	Description
❑ Step 17	Confirm that the device and driver location are correct. Click the Next button.	*If necessary, use the Back button to return to the previous screen.* *Windows copies the appropriate files from the CD, then displays the Finished installing software prompt.*

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Figure 36 indicates that Windows has finished installing the software for the USB serial port.

Figure 36 - Win 98/98SE Finished installing prompt



Step	Procedure	Description
❑ Step 18	Click Finish.	*The wizard briefly displays a series of Unknown hardware found and Installing messages as it installs the rest of the serial ports. When the desktop displays, your Freedom USB installation is complete!*

Uninstalling from Windows 98/98SE

Follow these steps in the event that you need to uninstall or reinstall the Freedom USB software.

1. From the Control Panel, select System.
2. Select the Device Manager tab.
3. Scroll down to Multi-port serial devices and expand.
4. Highlight Quatech Freedom USB; for example, QSU-100 USB-to-Serial Converter. Click Remove.
5. Click OK at the Confirmation screen. Note that this also removes all the serial ports associated with your Freedom USB.

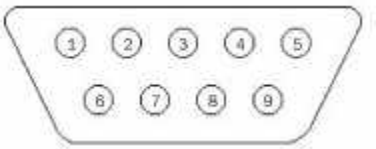
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Making external connections

RS-232 serial connections

The Freedom USB-100 RS-232 adapters all come with standard male DB-9 connectors. The figure below shows the pin designations.

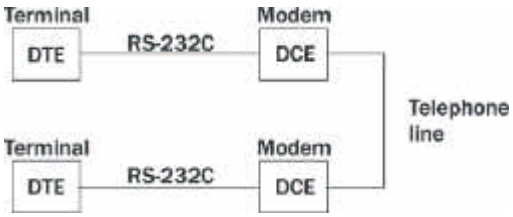
Figure 37 - RS-232 DB-9 pin designations



RS-232-C devices are classified by their function as either Data Terminal Equipment (DTE) or Data Communication Equipment (DCE).

Figure 38 - Use of DTEs and DCEs in a communication link

Figure 38 illustrates role of DTE and DCE devices in a communications link.



Note: A DTE devices is the communication source. A DCE device provides a communication channel between two DTE-type devices.

Freedom USB-100 adapters are DTE devices that conect to peripheral equipment through a male DB-9 connector. The following table lists the serial port connector definitions.

Table 3 - RS-232 DB-9 signal definitions

RS-232 signal description	DTE connection DB-9
Data Carrier Detect (DCD)	1
Receive Data (RxD)	2
Transmit Data (TxD)	3
Data Terminal Ready (DTR)	4
Signal Ground	5
Data Set Ready (DSR)	6
Request To Send (RTS)	7
Clear To Send (CTS)	8
Ring Indicate (RI)	9

Note: In many applications, DCEs are unnecessary. This allows you to use a null modem cable (modem eliminator cable) to directly connect two DTE-type devices.

DTE- and DCE-type devices have complementary pinouts that allow terminals and modems to connect directly using a one-to-one cable as shown in Figure 39.

See Figure 39 on the following page for a typical null modem cable.

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Figure 39 illustrates the RS-232C pinouts for typical DTE-to-DCE and DTE-to-DTE (null modem) cables with 25-pin connectors.

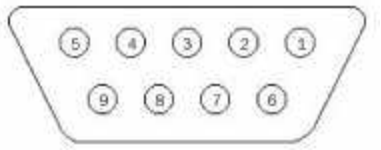
Figure 39 - Cabling requirements for RS-232C devices



RS-422/485 serial connections

The Freedom USB-200/300 RS-422/485 adapters all come with standard female DB-9 connectors. The figure below shows the pin designations.

Figure 40 - RS-422/485 DB-9 pin designations



Freedom USB-200/300 serial USB adapters provide four differential communication signals (either RS-422 or RS-485) per channel. Transmit Data (TxD) and Auxiliary Output (AuxOut) are the two output signals. Receive Data (RxD) and Auxiliary Input (AuxIn) are the two input signals. The adapters also provide a ground signal.

Note: Refer to Advanced Options using Device Manager for details on software-selectable advanced options.

The AuxOut pair can carry the UART's RTS signal. The AuxIn pair can carry the UART's CTS signal. Alternatively, the AuxOut pair can be configured to internally loopback to the AuxIn pair, with the UART's RTS signal also looped back to its CTS signal. The following table shows the RS-422/485 connector definitions.

Table 4 - RS-422/485 DB-9 signal definitions

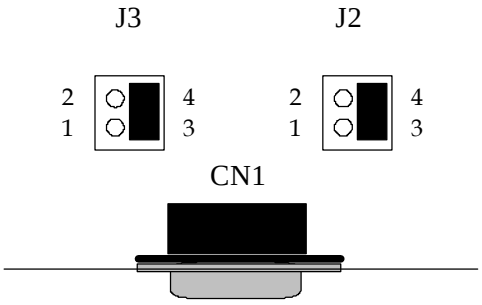
RS-422/485 signal description	All ports
	DB-9
Auxiliary Output (AuxOut+)	1
Transmit Data (TxD+)	2
Signal Ground	3
Receive Data (RxD+)	4
Auxiliary Input (AuxIn+)	5
Auxiliary Output (AuxOut–)	6
Transmit Data (TxD–)	7
Receive Data (RxD–)	8
Auxiliary Input (AuxIn–)	9

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Configuring termination resistors

Factory installed resistors allow for Freedom USB-200/300 signal line termination in compliance with RS-422 and RS-485 standards. You can select or remove the desired termination by configuring the associated jumper for each port. The following Figure shows the factory default configuration: no termination.

Figure 41 - RS-422/485 jumper settings



Factory Default = pins 3 & 4
(no termination)

Jumpers J2 through J5 (DSU) or J2 through J9 (QSU/ESU/HSU) allow the following selections:

- RS-422 (100 ohm) termination
- RS-485 (120 ohm) termination
- no termination

For normal operations over shorter distances or when using a termination in the connecting cable, use the default setting. For communications over great distances or if termination via the connecting cable is not feasible, configure the jumpers for the desired termination as follows.

- RS-422 termination, jumper pins 1 and 3
- RS-485 termination, jumper pins 2 and 4

Note: To access the USB adapter directly, remove the four screws on the bottom of the box and open the top cover.

Only terminate signals that are present in the cable. If the auxiliary input is not used and is not needed or wired in the cable, do not select the auxiliary input termination on the board. See the following Table for termination jumper assignments.

Configure each DB-9 connector as shown in the Table below.

Table 5 - RS-422/485 termination jumpers

	Receive Data (pins 4 and 8)	Auxiliary Input (Pins 5&9)
Port 1	J2	J3
Port 2	J4	J5
Port 3	J6	J7
Port 4	J8	J9

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Testing DB-9 serial ports in HyperTerminal

Note: You can use any conductive wire to make the necessary connections – even a paperclip!

This section explains how to test the functionality of your USB serial adapter using Hyperterminal. Follow either the directions under Testing RS-232 ports or Testing RS-422/485 ports, depending on whether you have a Freedom USB-100 or a Freedom USB-200/300.

The pins that you need to connect differ, depending on the type of connector.

The directions for Hyperterminal procedures are the same for all serial adapters. See Running Hyperterminal on page 33.

Testing RS-232 ports

This procedure explains how to troubleshoot an RS-232 DB-9 serial adapter using Hyperterminal.

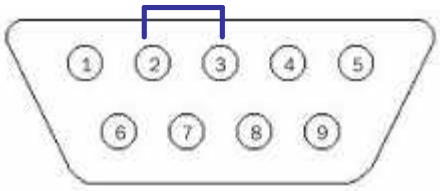
Before testing your serial ports, you must first hook up a loopback. A loopback connects the output signal (TxD) to the input signal (RxD) in a single serial port connector to make it seem like there are two ports connected together.

Making a Freedom USB-100 loopback

Step	Procedure	Description
❑ Step 1	Turn off the computer.	
❑ Step 2	Connect RxD (pin 2) and TxD (pin 3) of serial port 1. Repeat for each serial port.	*Use any kind of conductive wire, even a paper clip.*
❑ Step 3	Turn on the computer.	*You are now ready to test each port individually.*

Figure 42 illustrates the jumper location for a loopback on an RS-232 DB-9 connector for a Freedom USB-100.

Figure 42 - RS-232 DB-25 connector



Install a wire jumper to connect the following signals:

RxD (pin 2) to TxD (pin 3)

Testing RS-422/485 ports

Making a loopback

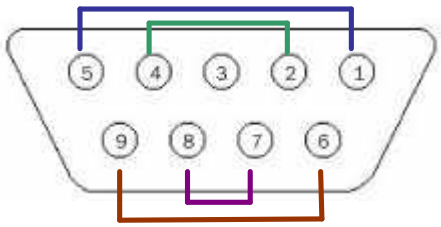
Step	Procedure	Description
❑ Step 1	Turn off the computer.	
❑ Step 2	Connect the following signals on serial port 1. Repeat for each serial port. AuxOut+ (pin 1) to AuxIn+ (pin 5) TxD+ (pin 2) to RxD+ (pin 4) TxD– (pin 7) and RxD– (pin 8)	*Use any kind of conductive wire, even a paper clip.*

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Step	Procedure	Description
	AuxOut– (pin 6) to AuxIn– (pin 9) Repeat for each serial port.	
❑ Step 3	Turn on the computer.	*You are now ready to test each port individually.*

Figure 43 illustrates the jumper location for a loopback on the RS-422/485 DB-9 connector for Freedom USB-200/300s.

Figure 43 - RS-422/485 DB-9 connector



Install wire jumpers to connect the following signals:

AuxOut+ (pin 1) to AuxIn+ (pin 5)

TxD+ (pin 2) to RxD+ (pin 4)

TxD– (pin 7) to RxD– (pin 8)

AuxOut– (pin 6) to AuxIn– (pin 9)

Running Hyperterminal

Step	Procedure	Description
❑ Step 1	Launch HyperTerminal.	*In Windows, select Programs/ Accessories/ Communications/ HyperTerminal.*
❑ Step 2	Create a new session.	*When prompted, give the session any name you wish.*
❑ Step 3	Select the COM # associated with port 1 from the drop down list.	*You are now set up to test the first serial port.* *Note: Leave all settings at default.*
❑ Step 4	With the session open, type any text.	*If the text you type is echoed on the screen, the port is functioning properly.*
❑ Step 5	Close the session.	
❑ Step 6	Repeat steps 2 through 5 for each serial port.	*If the text you type is echoed on the screen, the port is functioning properly.*

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Using Device Manager

This section explains how to use Device Manager to view the properties of the serial ports enumerated by the Freedom USB.

Accessing Device Manager

Win XP and 2000

Step	Procedure	Description
❑ Step 1	Select Start – Control Panel.	
❑ Step 2	Double click the System icon.	*The System Properties dialog box opens.*
❑ Step 3	Click the Hardware tab, and then press the Device Manager button.	*Device Manager lists all the hardware devices that are registered inside the Windows registry.*

Win 98, 98SE, and Me

Step	Procedure	Description
❑ Step 1	Select Start – Settings – Control Panel.	
❑ Step 2	Double click the System icon.	*The System Properties dialog box opens.*
❑ Step 3	Click the Device Manager tab.	*Device Manager lists all the hardware devices that are registered inside the Windows registry.*

Exploring Device Manager screens

Win XP and 2000

Device Manager provides two Freedom USB property dialog boxes.

- Ports (COM & LPT) device group property box
- Multi-port serial adapters device group property box

Use the Ports (COM & LPT) device group property box to view and set the port settings and to view device usage and driver information for the Freedom USB serial ports. Use the Multi-port serial adapters device group property box to view and set the advanced options and to view device usage and driver information for the Freedom USB.

Step	Procedure	Description
❑ Step 1	With Device Manager open, expand the Multi-port serial adapters device group.	*Your Freedom USB should appear in the list – for example, QSU-100 Quad RS-232 Serial Port (Group ID1)*
❑ Step 2	Double click the Freedom USB.	*The USB Serial Port Properties dialog box opens and displays the General tab.*

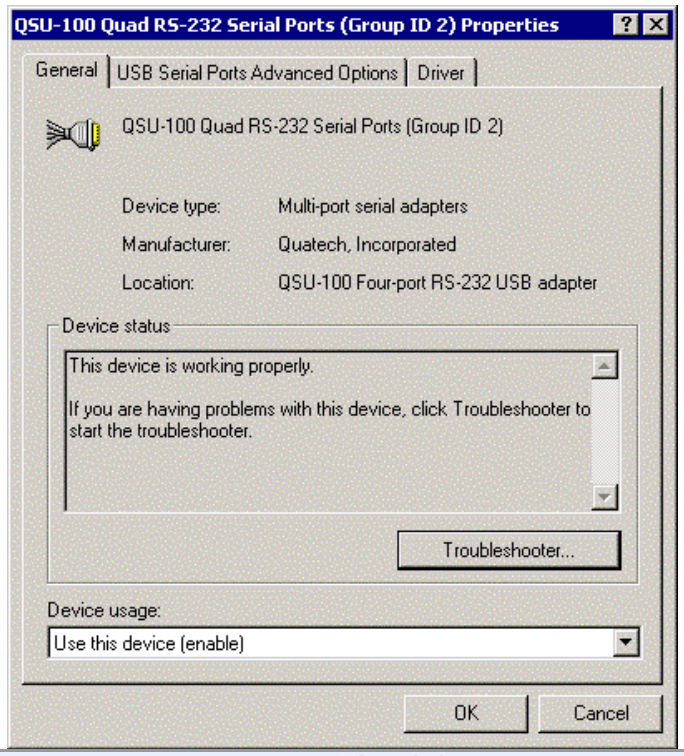
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Figure 44 - Win XP/2000 Device Manager USB serial port properties, General tab

Figure 44 illustrates the In Win XP/2000 General Tab, which tells you whether the Freedom USB is working properly and allows you to determine the device usage:

- Use this device (enable)
- Do not use this device (disable)

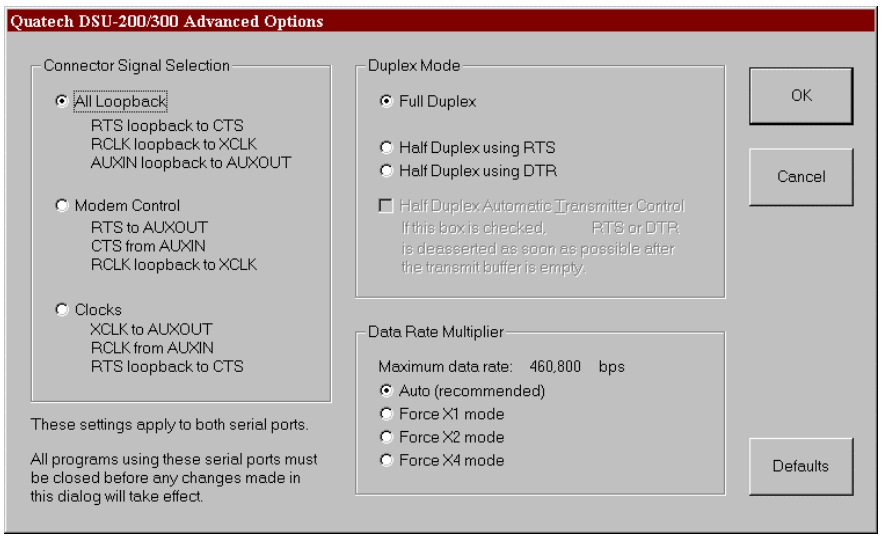
This dialog box also contains a link to Window's generic hardware troubleshooter



Step	Procedure	Description
❑ Step 3	Click the USB Serial Port Advanced Options tab to view the port setting properties.	*The Advanced Options dialog box displays.*

Figure 45 - Win XP/2000 RS-422/485 advanced options dialog window

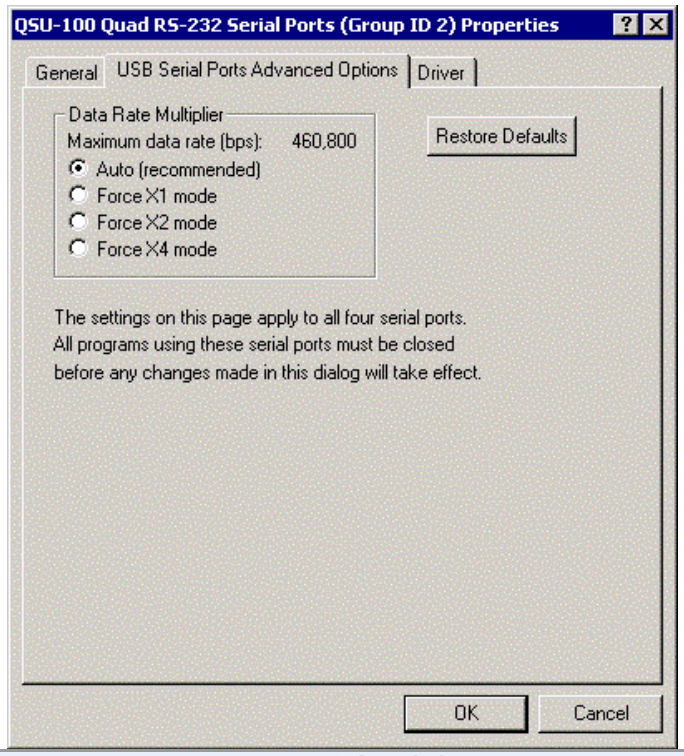
Figure 45 illustrates the Win XP/2000 RS-422/482 USB Serial Ports Advanced Options box, which lets you set the connector signal selection, the duplex mode, and the data rate multiplier:



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Figure 46 - Win XP/2000 RS-232 Advanced Options dialog window

Figure 46 illustrates the Win XP/2000 USB Serial Ports Advanced Options box, which lets you set the data rate multiplier:

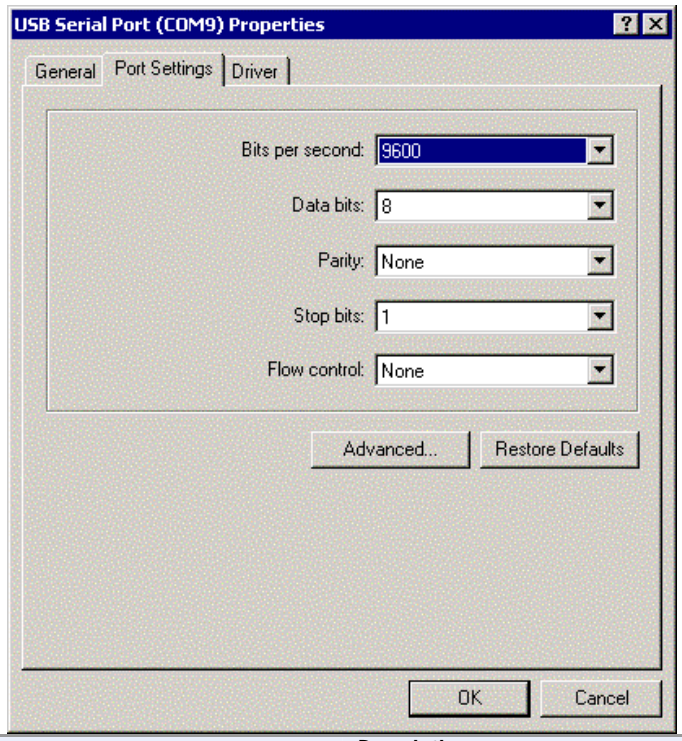


Step	Procedure	Description
❑ Step 4	The RS-232 USB Serial Port Advanced Options dialog box lets you set the data rate multiplier and restore the default settings. The RS-422/485 Advanced Dialog box also lets you set the connector signals selection and the duplex mode.	*See the Setting advanced options section on page 44 for details.* *See the Setting advanced options section on page 44 section for details.*
❑ Step 5	Click Cancel to close the Freedom USB property box.	
❑ Step 6	With Device Manager open, expand the Ports (COM & LPT) device group.	*The ports associated with the Freedom USB should appear in the list of ports.*
❑ Step 7	Double click the desired port.	*The USB Serial Port Properties dialog box opens and displays the General tab.*
❑ Step 8	Click the Port settings tab.	*The Port Settings dialog box displays.*

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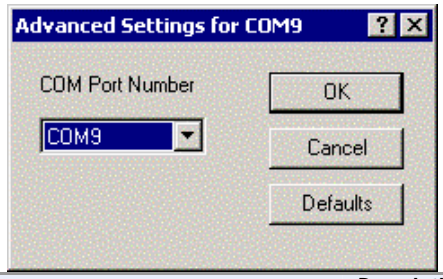
Figure 47 - Win XP/2000 USB serial port, Port settings box

Figure 47 illustrates the Win XP/2000 USB Ports Settings box, which lets you set the default port settings, view the advanced options, and restore the default settings.



Step	Procedure	Description
❑ Step 9	This Port Settings tab allows you to set default values for the following: ➢ Bits per second ➢ Data bits ➢ Parity ➢ Stop bits ➢ Flow control	*The Port Settings window can set defaults for the selected port.* *See the Setting advanced options section on page 44 section for details.*
❑ Step 10	Press the Advanced button.	*The Advanced Options dialog box opens.*

Figure 48 - Win XP/2000 USB serial port, Advanced settings box



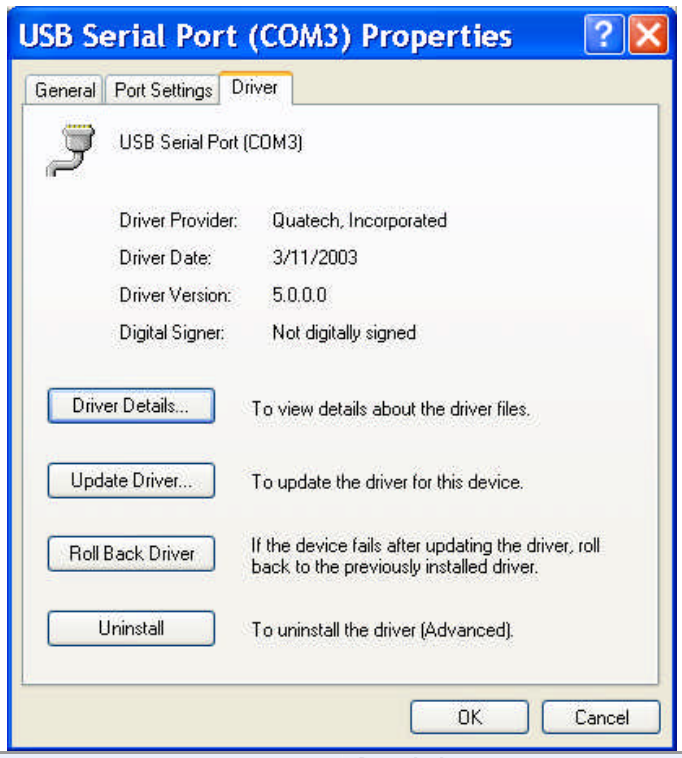
Step	Procedure	Description
❑ Step 11	Use the drop down box to select the port whose settings you wish to change. Click Cancel to return to the Port Settings tab.	

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Step	Procedure	Description
❑ Step 12	Click the Driver tab to view the driver information and update the driver.	*The USB Serial Driver properties dialog box displays.*

Figure 49 - Win XP/2000 USB serial port properties, Driver box

Figure 49 illustrates the Win XP/2000 USB Serial Ports Driver box, which lets you view the driver details and update, roll back (XP only), and uninstall the driver:

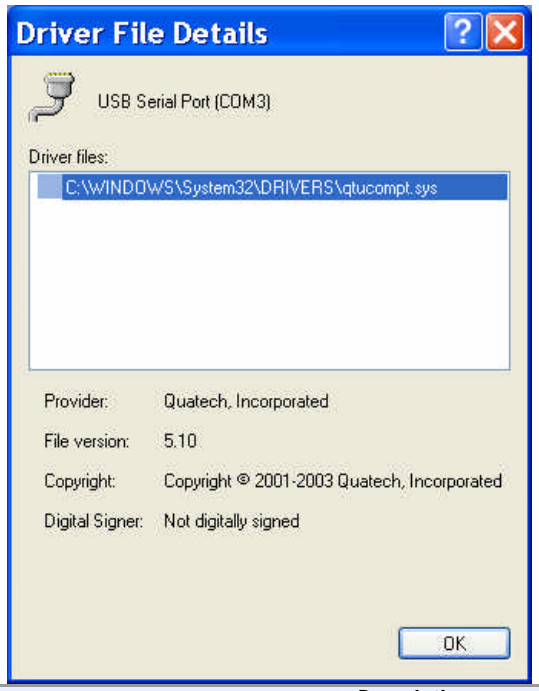


Step	Procedure	Description
❑ Step 13	You have several options: ➢ View detailed driver information ➢ Update the device drivers ➢ Uninstall your Freedom USB. ➢ Return to the previously installed driver. (XP only) ➢ Save your changes and exit. ➢ Abandon your changes and return to the Device Manager.	*Clicking Update Driver opens the Installation wizard opens.* *This also removes all the associated serial USB ports.* *Clicking OK also saves any changes from the other tabs.*
❑ Step 14	Click the Driver Details button to view detailed driver information.	*The Driver File Details dialog box opens. See the following figure.*

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Figure 50 - Win XP/2000 USB serial port, Driver file details box

Figure 50 illustrates the Win XP/2000 USB Serial Ports Driver Details box, which tells you the name and location of the driver files, the provider, file version, copyright date, and whether Microsoft has signed off on the driver.



Step	Procedure	Description
❑ Step 15	The Driver File Details dialog box displays the following information ➢ Provider ➢ File version ➢ Copyright ➢ Digital Signer (Win XP only) Click OK to return to the Driver tab.	 *Quatech is the provider.* *This is the version of the installed software.* *Indicates whether Microsoft has approved this version.*
❑ Step 16	Click Cancel to close the Freedom USB port property box.	

Win 98, 98SE, and Me

Device Manager provides two Freedom USB property dialog boxes.

- Ports (COM & LPT) device group property box
- Multi-port serial adapters device group property box

Use the Ports (COM & LPT) device group property box to view and set the port settings and the advanced options and to view device usage and driver information for the Freedom USB serial ports. Use the Multi-port serial adapters device group property box to view device usage and driver information for the Freedom USB.

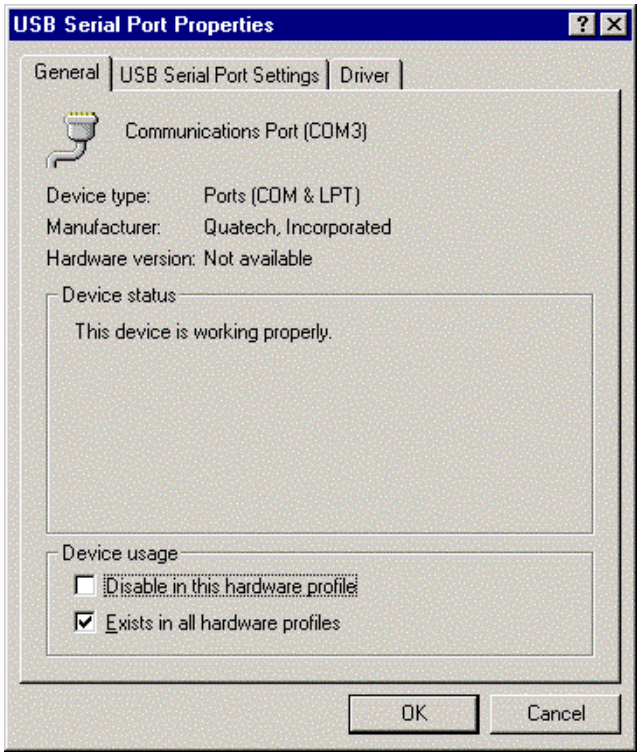
Step	Procedure	Description
❑ Step 1	With Device Manager open, expand the Ports (COM & LPT) device group.	*The ports associated with the Freedom USB should appear in the list of ports.*
❑ Step 2	Double click the desired port.	*The USB Serial Port Properties dialog box opens and displays the General tab.*

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Figure 51 - Win 98/98SE/Me USB serial port properties, General tab

Figure 51 illustrates the Win 98/98SE/Me General tab, which tells you whether the Freedom USB is working properly and allows you to determine the device usage:

- Disable in this hardware profile
- Exists in all hardware profiles

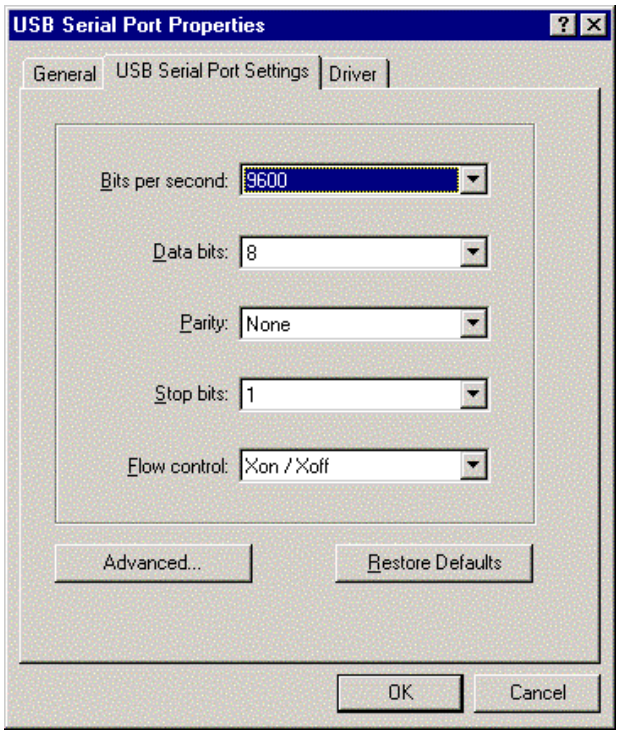


Step	Procedure	Description
❑ Step 3	Click the USB Serial Port Settings tab to view the port setting properties.	*The USB Serial Port Settings properties dialog box displays.*

Figure 52 - Win 98/98SE/Me USB serial port properties, USB Serial Port Settings tab

Figure 52 illustrates the In Win 98/98SE/Me USB Serial Port Settings tab, which lets you view and set default values for the following serial port settings:

- Bits per second
- Data bits
- Parity
- Stop bits
- Flow control



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Step	Procedure	Description
❑ Step 4	The USB Serial Port Settings tab allows you to set default values for the following: ➢ Bits per second ➢ Data bits ➢ Parity ➢ Stop bits ➢ Flow control	*The Port Settings window can set defaults for the selected port.* *See the Setting advanced options section on page 44 for details.*
❑ Step 5	Click the Advanced button to open the Advanced Options dialog box.	*The Serial Ports Advanced Options box displays. See the Setting advanced options section on page 44 section for details.*

Figure 53 - Win 98/98SE/Me USB serial port properties, USB Serial Port Advanced Options box

Figure 53 illustrates the Win 98/98SE/Me RS-232 USB Serial Ports Advanced Options box, which lets you set the data rate multiplier:

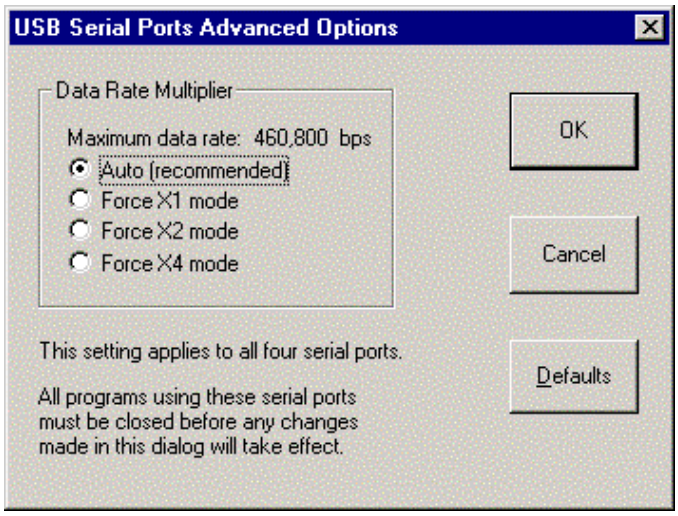
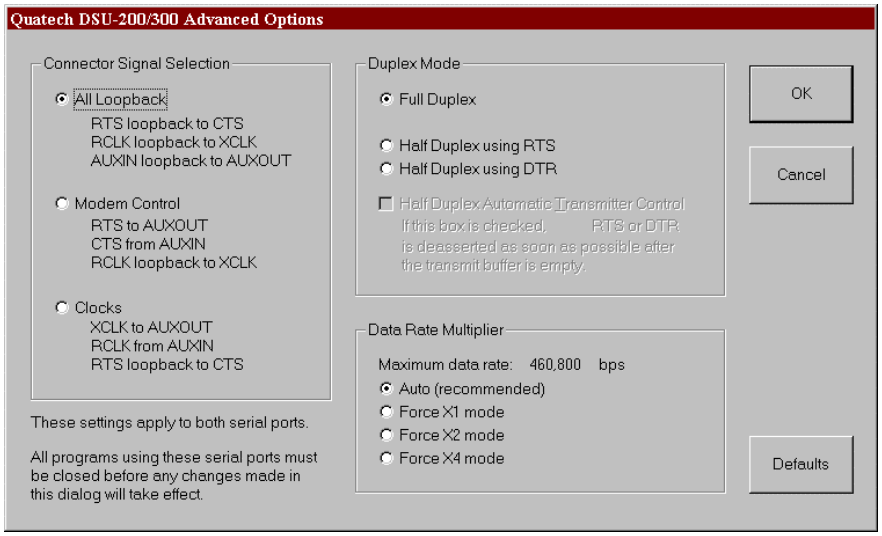


Figure 54 - Win 98/98SE/Me RS-422/485 advanced options dialog window

Figure 54 illustrates the Win 98/98SE/Me RS-422/485 USB Serial Ports Advanced Options box, which lets you set the connector signal selection, the duplex mode, and the data rate multiplier:



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Step	Procedure	Description
❑ Step 6	Click Cancel to return to the USB Serial Port Settings properties dialog box.	
❑ Step 7	You have three additional options: ➢ Click the Restore Defaults button to restore the selected port to the default settings. ➢ Click the Driver tab to view the driver information and update the driver. ➢ Click the OK button to save your changes.	*The USB Serial Driver properties dialog box displays. See the following figures. Clicking OK saves any changes you made in any of the dialog boxes.*

Figure 55 illustrates the Win 98/98SE/Me USB Serial Ports Driver box, which lets you view the driver details and update, and uninstall the driver:

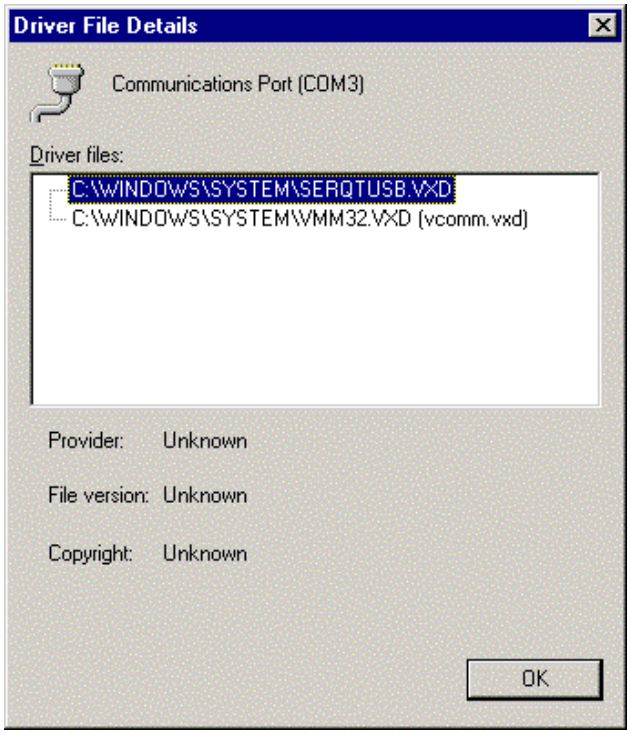
Figure 55 - Win 98/98SE/Me USB serial port properties Driver box



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Figure 56 - Win 98/98SE/Me USB Serial port, Driver file details box

Figure 56 illustrates the Win 98/98SE/Me USB Serial Ports Driver Details box, which tells you the name and location of the driver files, the provider, file version, and copyright date.



Step	Procedure	Description
❑ Step 8	Click OK to close the Driver file details box. Click Cancel to close the Freedom USB port property box.	

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Setting advanced options

Notes: Changing any setting in the advanced options window affects all ports on the Freedom USB adapter.

The Freedom USB port properties can only be altered from the Device Manager window. Attempting to access these properties from another software program will generate an error message box that refers you to the Device Manager.

See Exploring Device Manager screen on page 34 for help in navigating through the Device Manager screens.

Data Rate Multiplier

Notes: We recommend leaving the Data Rate Multiplier in Auto mode unless the application specifically requires otherwise.

The Freedom USB uses an accelerated UART clock frequency to boost data rates to as high as 460,800 bits per second. This setting determines the amount of data rate acceleration applied.

Auto (default)

Note: This setting is suitable for most applications.

Select this radio button to allow the USB serial port device drivers to automatically adjust the clock as necessary. The software application can request any desired baud rate up to 460,800 bits per second.

Force X1 mode

Note: This setting will not enhance most applications.

Select this radio button to limit each serial port to a maximum of 115,200 bits per second. The software application can request any desired baud rate up to 115,200 bits per second.

Force X2 mode

Note: This setting allows applications not capable of asking for higher baud rates to achieve them.

Select this radio button to allow each serial port to run at a maximum of 230,400 bits per second. The software application can request any desired baud rate up to 115,200 bits per second. The actual baud rate will be two (2) times higher than requested.

Force X4 mode

Note: This setting allows applications not capable of asking for higher baud rates to achieve them.

Select this radio button to allow each serial port to run at a maximum of 460,800 bits per second. The software application can request any desired baud rate up to 115,200 bits per second. The actual baud rate will be four (4) times higher than requested.

Connector Signal Selection (DSU/QSU/ESU/HSU-200/300 only)

This setting determines which signals are routed to the AuxIn and AuxOut pins of the serial port connectors. Regardless of which setting is chosen, each UART's DTR output is internally looped back to its own DSR, DCD, and RI inputs.

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All Loopback (default)

Select this radio button when only transmit and receive data signaling is required.

- Each UART's RTS output is internally looped back to its CTS input.
- Each port's AuxIn signal pair is looped back to its AuxOut signal pair at the connector.

Modem Control

Select this radio button when hardware flow control is required.

- Each UART's RTS output and CTS input are routed to the AuxOut and AuxIn signal pairs, respectively.

Duplex Mode (DSU/QSU/ESU/HSU-200/300 only)

Full Duplex (default)

Select this radio button to allow simultaneous transmit and receive operation. Transmit and receive data must move over separate dedicated pairs of conductors in the attached cable. Each UART's transmit drivers are always active in this mode.

Half Duplex using RTS

Select this radio button to allow communication in only one direction at a time. Transmit and receive data can share a single pair of conductors in the attached cable. The software application can disable the port's transmit drivers by deasserting the UART's RTS output. To allow transmission again, the software application must assert the RTS output.

Half Duplex using DTR

This mode operates the same as Half Duplex using RTS, except that the UART's DTR output is used.

Half Duplex Automatic Transmitter Control

If this box is checked when using a half duplex mode, the USB serial adapter will automatically control the RTS or DTR signal to enable and disable the transmit drivers. The transmit drivers will be enabled when there is data from the software application ready to be sent. The transmit drivers will be disabled after all data has been transmitted and the device drivers' internal transmit buffers are empty. The maximum length of time between the last character transmitted and the disabling of the drivers is 1 millisecond.

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Troubleshooting

Note: Any unauthorized repairs or modifications will void the Freedom USB's warranty.

This section lists some common problems and their causes. If the information below does not provide a solution, contact Quatech technical support.

Problem	Cause	Solution
The Freedom USB cannot communicate with other equipment.	➢ The cables are not connected correctly.	1. Check the Freedom USB cables to make sure that they are connected correctly. 2. Make sure that each cable is securely attached.
	➢ The device driver is not installed.	1. Double check the Device Manager per the instructions in Using Device Manager to ensure that drivers are installed correctly and that all devices are working properly. 2. Try removing the USB adapter from the Device Manager window and then repeat the hardware installation instructions.
	➢ The USB port is faulty.	1. If possible, connect a known good USB device to the PC or hub connector and see if it operates properly.

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Appendix A

Specifications

Bus interface	USB Specification 1.1		
Data rates	Number of simultaneously operating ports	1-, 2-, 3-port adapters (232 and 422)	8-, 16-port adapters (232 and 422)
	1, 2	230k bps*	230k bps
	3, 4	115k bps	115k bps
	5+	N/A	57 – 115k bps
	* 460.8k bps possible for any one port under certain conditions Actual baud rates depend on the following: ➢ Hardware flow control ➢ Horsepower of the host computer ➢ Quality of and length of cables ➢ Continuous or "bursty" data		
Ports	SSU-100: 1 DSU-100: 2 QSU-100: 4 ESU-100 8 HSU-100 16 DSU-200/300: 2 QSU-200/300: 4 ESU-200/300 8 HSU-200/300 16		
UARTs	One 16650 UART with 16-byte FIFO per port		
Transceivers: (SP211HB or equivalent) SSU-100 DSU-100 QSU-100 ESU-100 HSU-100	RS-232 Output Voltage Swing: +/–5V min, +/–7V typical RS-232 Input Voltage Range: –15V min, +15V max Input Threshold Low: 0.8V min, 1.2V typical Input Threshold High: 2.4V max, 1.7V typical		
Transceivers: (MAX491 or equivalent) DSU-200/300 QSU-200/300 ESU-200/300 HSU-200/300	Differential Driver Output (50?Load): +2V min Differential Driver Output (27?Load): +1.5V min +5V max High Input: +2V min Low Input: +0.8V max Driver Rise or Fall Time: 5ns min, 15 ns typ, 25ns max Driver Input to Output Delay: 10 ns min, 30 ns typ, 60ns max Receiver Input to Output Delay: 20 ns min, 90ns typ, 150ns max		

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Connectors	SSU/DSU/QSU/ESU/HSU-100 DB-9 Male Connectors DSU/QSU/ESU/HSU-200-300 DB-9 Female Connectors
Dimensions	3.6" L x 1.7" W x 1.0" H (SSU) 7.2" L x 4.3" W x 1.0" H (DSU/QSU) 9.3" L x 6.5" W x 2.5" H (ESU, older revisions) 7.1" L x 5.3" W x 2.3" H (ESU, Revision H and later) 9.0" L x 6.5" W x 4.5" H (HSU)
Power Requirements Power Requirements, cont.	USB bus powered (no external power connection required) Suspend Power: < 500 uA Unconfigured Power: < 100 mA Configured Power: < 500 mA (HSU uses two USB connections, each meeting the above limits.)
Temperature:	Operating: 0 to 70 C Storage: –50 to 80 C
Humidity	10 to 90%
OS Support	Windows 98?Windows ME , Windows 2000, Windows XP, Windows NT 4.0

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Appendix B

Warranty information

Quatech, Inc. warrants the SSU/ DSU/QSU/ESU/HSU-100/200/300 to be free of defects for five (5) years from the date of purchase. Quatech, Inc. will repair or replace any board that fails to perform under normal operating conditions and in accordance with the procedures outlined in this document during the warranty period. Any damage that results from improper installation, operation, or general misuse voids all warranty rights. No representation is made regarding the suitability of this product for any particular purpose.

Please complete the following information and retain for your records.

DATE OF PURCHASE: _____

MODEL NUMBER: SSU/ DSU/QSU/ESU/HSU-100/200/300

PRODUCT DESCRIPTION: Serial USB Adapter

SERIAL NUMBER: _____

All products returned to Quatech for either warranty or non-warranty repair MUST be assigned a Returned Material Authorization (RMA) number prior to shipment. This RMA number must be clearly marked on the exterior of the product's return packaging and in any correspondence to ensure proper routing and prompt attention. To obtain an RMA number, contact Quatech Technical Support Department at 1-800-553-1170 or (330) 655-9000. In order to prevent damage to returned merchandise during shipment, please package electronic components in anti-static/shock proof materials.

For **warranty** repair/returns, please have the following information available when contacting the Technical Support department:

1. Model number and serial number of the product under warranty
2. Repair instructions and/or specific description of the problem

For **non-warranty** repairs or upgrades, contact the Technical Support department for current repair charges and please have the following information available:

1. Purchase order number to cover the cost of the service
2. Model number and serial number of the product
3. Repair or upgrade instructions relative to the product

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